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[54] **SHEET PRESSING MECHANISM IN A PEN TYPE RECORDING DEVICE**

[75] Inventors: **Mitsugu Fujiwara; Yoshinori Sakaue,** both of Morioka; **Tomio Aso,** Kitakami; **Koshiro Kurokawa,** Hanamaki; **Hideo Obara,** Ezuriko, all of Japan

[73] Assignee: **Alps Electric Co., Ltd.,** Tokyo, Japan

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[51] **Int. Cl.**[3] **G01D 15/24;** B41J 11/00; B65H 17/38

[52] **U.S. Cl.** ..... **346/136;** 346/139 R; 400/18; 400/617; 400/636; 400/639; 226/181; 226/188; 226/191

[58] **Field of Search** ..... 346/136, 139 D, 139 R; 400/600.2, 18, 625, 630, 636.1, 637.1, 642, 645.4, 617, 636, 639; 226/188, 181, 191

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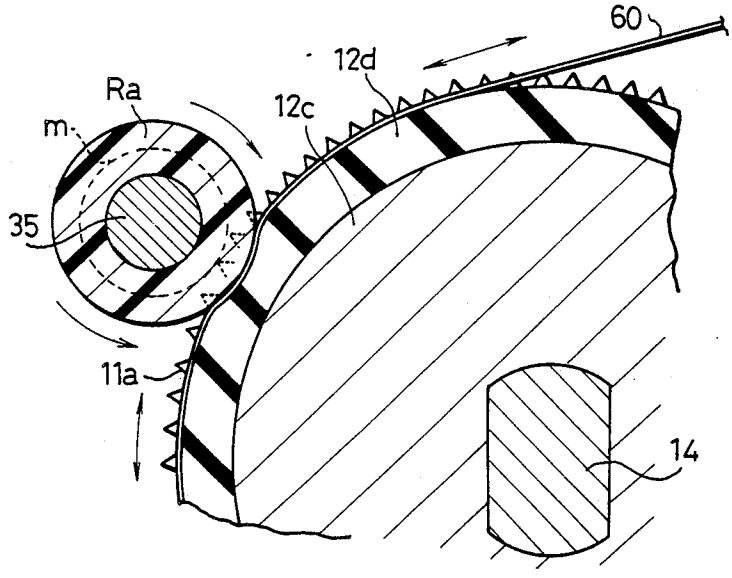
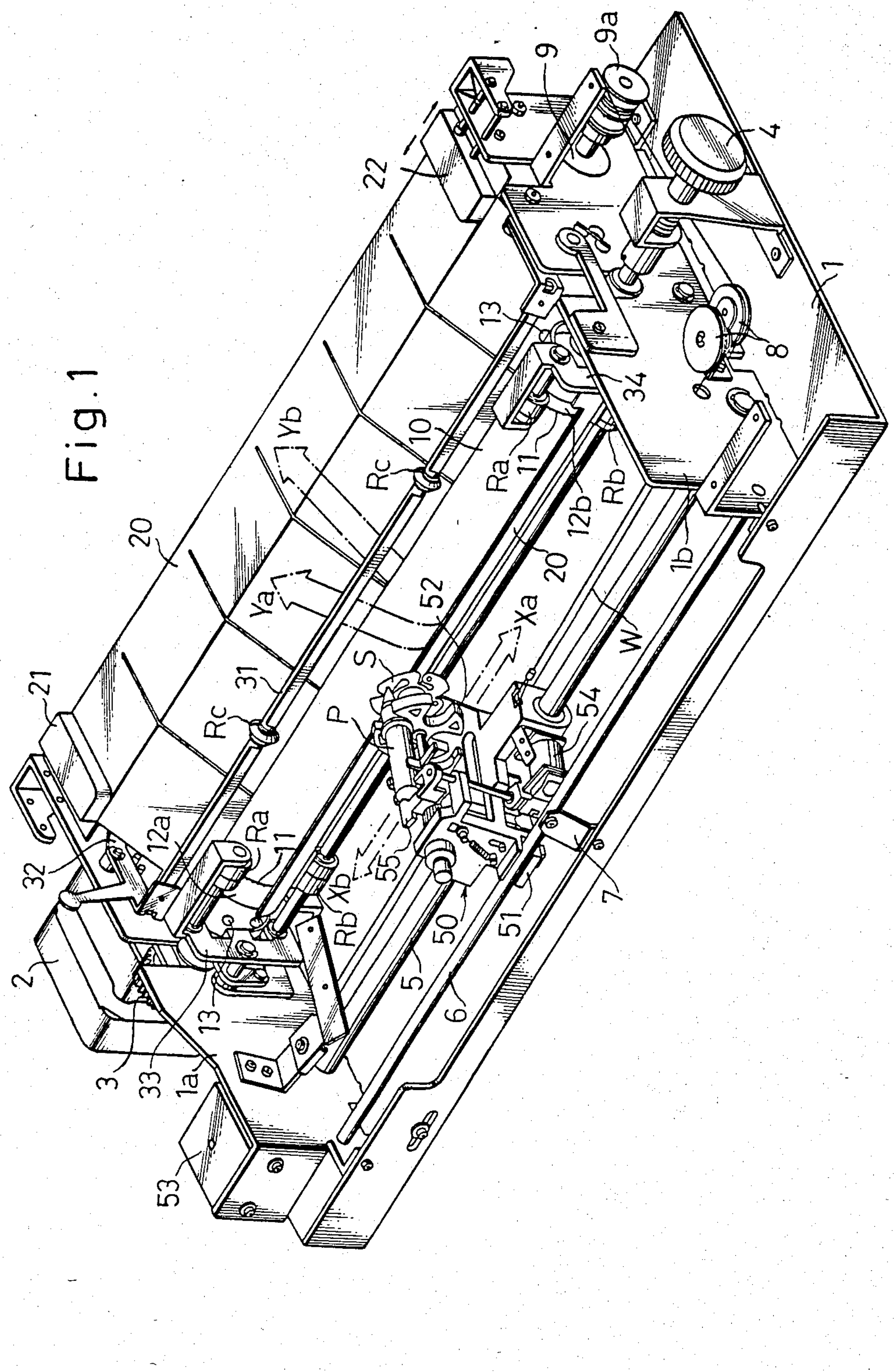
Primary Examiner—E. A. Goldberg
Assistant Examiner—Gerald E. Preston
Attorney, Agent, or Firm—Guy W. Shoup; Gerard F. Dunne

[57] **ABSTRACT**

A sheet pressing mechanism in a pen type recording device including a rotatable platen and a pen adapted to move in the axial direction of the platen while contacting the platen, in which pressure rollers are brought into contact with outer peripheral surfaces of end portions of the platen, the pressure rollers being rotatably mounted on a support shaft extending in parallel with the axis of the platen, and in which the said outer peripheral surfaces of the end portions of the platen are formed of a soft material capable of being depressed by the contact pressure of the pressure rollers.

4 Claims, 3 Drawing Figures




9a
9
4
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1
8
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Yb
10
Rc
Ra
11
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Ya
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Xa
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S
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12a
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Fig. 1

Fig. 2

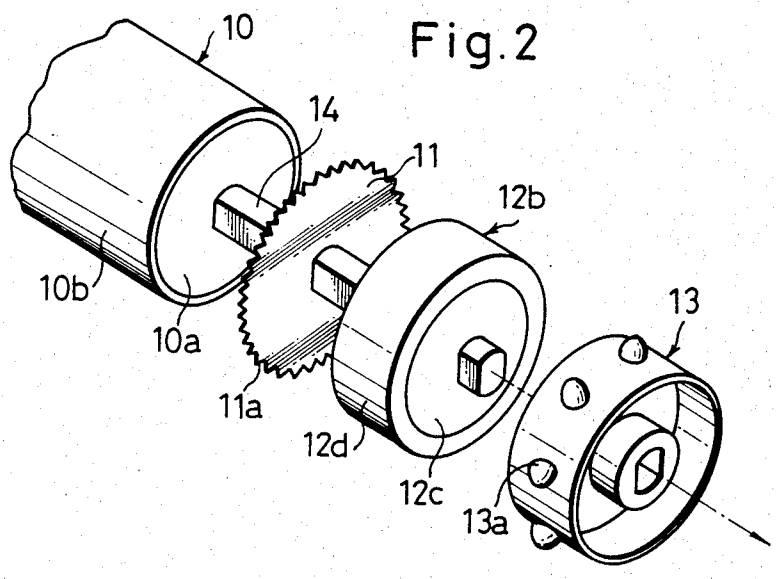
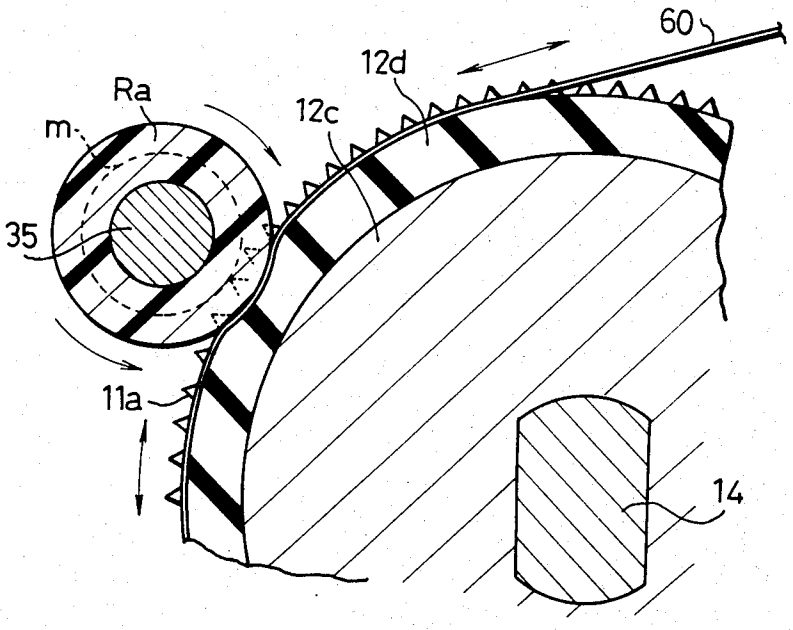


Fig. 3



SHEET PRESSING MECHANISM IN A PEN TYPE RECORDING DEVICE

BACKGROUND OF THE INVENTION

(1) Field of the Invention

The present invention relates to a pen type recording device for forming characters, figures, graphs and the like on a sheet fed by a platen. Particularly, it is concerned with a sheet pressing mechanism capable of holding edge portions of a sheet positively on the platen.

(2) Description of the Prior Art

Various conventional recording devices such as impact printers have been proposed, but it has been impossible to draw figures, graphs and the like freely with such printers, although such printers can form characters and other symbols. In an effort to eliminate such inconvenience, a pen type recording device has recently been put to practical use, in which a recording sheet is held around a roller serving as a platen so as to be fed in the circumferential direction of the platen, and a pen opposed to the sheet can be moved in the axial direction of the platen. By controlling the feed of the sheet and the movement of the pen, it is possible to form on the sheet not only characters, but also figures and the like. For forming a figure or a graph on a recording sheet by such pen type recording device it is sometimes necessary that the recording sheet be reciprocated many times by the platen. At this time, slippage may occur between the platen and the sheet, thus causing deviation of the feed of the sheet from the motion of the platen, which may result in a distorted figure being formed on the sheet. Therefore, it is necessary that the sheet be held positively with respect to the platen.

SUMMARY OF THE INVENTION

The present invention has been made to solve the above-mentioned problems, and it is the object thereof to provide a sheet pressing mechanism in a pen type recording device capable of holding a recording sheet positively with respect to a platen.

The present invention is characterized in that pressure rollers for pressing a recording paper are brought into pressure contact with peripheral surfaces at end portions of a platen, and in that the peripheral surfaces of end portions of the platen are formed of a soft material such as a soft rubber capable of being indented by the contact pressure of the pressure rollers.

An embodiment of the present invention will be described below with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of the entirety of a pen type recording device;

FIG. **2** is an exploded perspective view showing a structure of an end portion of a platen; and

FIG. **3** is a sectional view showing in what manner a recording sheet is held by a sheet pressing mechanism embodying the invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIG. **1**, there is shown an perspective view of a pen type recording device, in which a multicolor switching type pen P is moved in the direction of the arrows Xa and Xb, while a recording sheet (not shown) is fed in directions of arrows Ya and Yb by means of a platen **10**. By controlling the movement of the pen and the sheet in these X and Y directions, characters, figures and the like can be drawn on the sheet. The platen **10** can be rotated both forwardly and backwardly by a gear **3** by virtue of a driving force of a stepping motor **2** mounted on a base **1**. It can also be rotated manually by a handle **4**. The recording sheet is inserted in the Ya direction from over a guide plate **20**, on which are mounted a fixed positioning member **21** and a movable positioning member **22**. In a position between both positioning members **21** and **22** the recording sheet is fed below the platen **10** while being guided at both side ends thereof by the positioning members **21** and **22**. The movable positioning member **22** can be moved in the directions shown by the arrows to adjust to various sheet sizes such as **A4** and **B5** sizes. The sheet fed below the platen **10** is guided by the fore end of the guide plate **20** and reaches the recording side of the platen **10**, where it is held between pressure rollers Ra, Rb each provided on respective right and left sides of the platen **10**. The upper end of the sheet further passes below sheet pressing rollers Rc which are positioned above the platen **10**, and extends in the direction of the arrow Ya. The rollers Rc are for preventing an end portion in the Ya direction of the sheet under recording from being turned upwardly toward the pen P.

When loading or positioning the sheet, it is necessary to disengage the pressure rollers Ra and Rb from the sheet **10**, and this operation is effected by lifting up the platen pressing shaft **31**. More specifically, left and right support members **33** and **34** for the pressure rollers Ra and Rb are interlocked with the pivotable lever **32** which supports the sheet pressing shaft **31** and are adapted to move away from the platen **10** upon a lifting motion of a pivotable lever **32**.

The pen P is carried on a pen carriage **50**. The pen carriage **50** is adapted to move in the Xa-Xb direction on a main shaft **5** extending between the side plates **1***a* and **1***b* which are mounted on the base **1**. The pen carriage **50** is formed at its rear portion with a guide groove **51** for sliding on an auxiliary shaft **6** extending between the side plates **1***a* and **1***b*. The angle of the pen carriage **50** relative to the platen **10** depends upon the relative position of the main shaft **5** and auxiliary shaft **6**. In the figure, the pen carriage **50** is inclined so that the tip end of the pen P faces downward. This is for improving the flow of ink within the pen P.

Because the supporting span at both ends of the auxiliary shaft **6** is long, a central portion of the auxiliary shaft **6** is fixed onto the base **1** through a strut **7**, whereby the main shaft **5** and the auxiliary shaft **6** are held in an exact parallelism, and the angle of the pen P relative to the platen **10** is kept constant while the pen carriage **50** moves in the Xa–Xb direction.

The movement of the pen carriage **50** in the Xa–Xb direction is effected by being pulled with a wire W. The wire W is engaged with pulleys **8** mounted outside each of the side plates **1***a* and **1***b* and then wound around a pulley **9***a* of a stepping motor **9** which is mounted below the guide plate **20**. By forward and reverse rotation of the stepping motor **9**, the pen carriage **50** is pulled by the wire W in the Xa–Xb direction.

Four pens P can be held by a holder **52** on the pen carriage **50** (only one pen P is shown in FIG. **1**). The holder **52** is rotatable on the pen carriage **50** and this rotation is effected by a solenoid **53** mounted outside the

side plate 1*a*. More specifically, the main shaft **5** rotates at a predetermined angle by virtue of attraction of the solenoid **53** and this rotating force of the main shaft **5**, which has a non-circular section, is transmitted to a ratchet mechanism within the pen carriage **50** whereby the holder **52** is rotated thereby allowing a desired pen P to reach a recording position (the uppermost position). The pen P is held in a retracted position relative to the platen **10** by being pushed with a return leaf spring S. In this state, when a hammer **55** is driven by a solenoid **54** mounted on the pen carriage **50**, the tip end of the pen P in the recording position is pushed by the hammer **55** and thereby comes into pressure contact with the platen **10**.

More particularly, one of the four pens P, having a desired color, is shifted to the uppermost position and then the pen carriage **50** is moved in the Xa–Xb direction by the stepping motor **9**, while the recording sheet is moved in the Ya–Yb direction by the stepping motor **2** while being held between the platen **10** and the pressure rollers Ra, Rb. And by pushing the pen P with the hammer **55** to bring its tip end into pressure contact with the sheet, characters, figures or the like can be drawn on the sheet according to motions in the X and Y directions.

Referring now to FIG. **2**, there is shown an exploded perspective view illustrating a structure of an end portion of the platen **10**, in which the platen **10** is fixedly mounted on a main shaft **14**, with the gear **3** being attached to an end portion of the main shaft **14**. The platen **10** is composed of a core member **10***a* made of aluminum or other material and a outer rubber layer **10***b* which covers the outer peripheral surface of the core member **10***a*. The outer rubber layer **10***b* is formed of a material having a high hardness. To both side ends of the platen **10** are attached toothed plates **11**, and short platens **12***a* (left) and **12***b* (right) are attached in positions outside the toothed plates **11**. And outside the short platens **12***a* and **12***b* are mounted sprockets **13**. The toothed plates **11**, short platens **12***a*, **12***b* and sprockets **13** are fitted on the main shaft **14** so as to be rotatable integrally with the shaft **14**.

The toothed plate **11** is obtained by blanking a thin metallic plate, with plural teeth **11***a* being formed on the circumference thereof, the teeth **11***a* projecting from the outer peripheral surface of the platen **10**.

The short platens **12***a* and **12***b* are each comprised of a core member **12***c* and a surface member **12***d* which covers the outer peripheral surface of the core member. The core member **12***c* is made of aluminum or other material like the core member **10***a* of the platen **10**, and the surface member **12***d* is formed of a material softer than the outer rubber layer **10***b*, e.g. a soft synthetic rubber or a foamed material. It is necessary for the surface member **12***d* to have a hardness to the extent that it can be depressed upon pressure contact with the pressure rollers Ra and Rb. The sprocket **13** is provided with circumferentially disposed pawls **13***a*.

The pressure rollers Ra and Rb are each mounted rotatably on a support shaft **35** which is parallel to the main shaft **14**, and those rollers are held in pressure contact with the short platens **12***a*, **12***b* and the teeth **11***a* by virtue of a spring pressure. In the portion of each of the pressure rollers Ra and Rb opposed to the teeth **11***a* is formed a groove "m" (the inside diameter of the groove "m" is shown in dotted line in FIG. 3). The pressure rollers Ra and Rb are formed of a material harder than that of the surface member **12***d* of the short platens **12***a* and **12***b*, e.g. a resin or a metal.

The following description is now provided about the function and effect of the present invention having the above-described construction.

Various kinds of sheets are employable as a recording sheet **60** to be used in this pen type recording device. In case the sheet **60** is provided at both side ends thereof with small feed holes, the sheet **60** is fed in the Ya–Yb direction while being held between the platen and the pressure rollers Ra, Rb. At this time, the small feed holes of the sheet **60** are engaged with the pawls **13***a* of the sprocket **13**, so that the sheet **60** is moved in complete synchronism with the rotation of the platen **10**.

In case the recording sheet **60** is a so-called letter paper not having such small feed holes at both side ends thereof, it is held at both side ends between the short platens **12***a*, **12***b*, toothed plates **11** and the pressure rollers Ra, Rb in pressure contact therewith. At this time, the teeth **11***a* of the toothed plate **11** bite in the sheet **60**, whereby the sheet is held firmly with respect to the platen **10**. Besides, the short platens **12***a* and **12***b* under pressure contact with the pressure rollers Ra and Rb are depressed or indented at their peripheral surfaces (the portion of the surface member **12***d*), so that by these indented portions the side ends of the sheet **60** are also held strongly. Because, the contact area between the sheet **60** and the short platens **12***a*, **12***b* is enlarged by such inward deformation. Moreover, a substantial projection of the teeth **11***a* becomes longer as a result of such deformation, so that the holding force of the teeth **11***a* for the sheet **60** becomes stronger. Thus, the side ends of the sheet **60** are kept completely integral with the platen by such deformation of the short platens **12***a*, **12***b* and by engagement thereof with the teeth **11***a*.

When the sheet **60** is integral with the platen **10** and is fed in complete synchronism with the rotation of the platen **10**, slippage between the sheet **60** and the platen is prevented during the recording operation, so that lines described with the pen P are free from distortion and the accuracy of recorded contents is improved.

The side ends of the sheet **60** can be held strongly by the aforementioned inwarded depression of the peripheral surfaces of the short platens **12***a* and **12***b*. Therefore, even without provision of the toothed plates **11**, the sheet **60** can be fed exactly without causing slippage by being held between the short platens **12***a*, **12***b* and the pressure rollers Ra, Rb.

In the illustrated embodiment, the pressure rollers Ra and Rb contact the short platens **12***a* and **12***b*, but also contact peripheral surface portions of the platen **10** partially at their fore end portions. Therefore, if the both end portions of the platen **10** with which the pressure rollers Ra and Rb come into contact are formed of the same material as that of the surface member **12***d*, the area of inward deformation is further expanded and the holding force for the sheet **60** is enhanced. Furthermore, if the hardness of the platen rubber **10** is made high while the diameter of the short platens **12***a* and **12***b* is made larger than that of the platen **10**, the depth deformation of the short platens **12***a* and **12***b* becomes larger even when the pressure rollers Ra and Rb also contact the outer rubber layer **10***b*, so that the holding force for the sheet **60** is enhanced.

According to the present invention, as described hereinabove, since the peripheral surfaces of the end portions of the platen are formed of a soft material capable of being depressed by the contact pressure of

the pressure rollers, the contact area is enlarged thus permitting a recording sheet to be held strongly at both side ends thereof. Consequently, a perfect synchronism is attained between the rotation of the platen and the feed of the sheet, with no slippage occurring therebetween, so that in the case of forming lines with the pen while reciprocating the sheet in the Ya–Yb direction, an exact recording without causing distortion of the lines can be performed.

What is claimed is:

1. A sheet holding mechanism in a pen type recording device including a rotatable platen and a pen adapted to move in the axial direction of the platen while contacting paper held against the platen for forming images on a portion of the paper held against a central portion of the platen, said sheet holding mechanism including pressure rollers brought into pressure contact with outer peripheral surfaces of the end portions of said platen, said pressure rollers being rotatably mounted on a support shaft extending in parallel with the axis of said platen, said outer peripheral surfaces of the end portions of said platen being formed of a material softer than the material forming the central portion of the platen and capable of being indented by the contact pressure of said pressure rollers.

2. A sheet holding mechanism according to claim 1, said outer peripheral surfaces of the end portion of the platen having a diameter greater than the central portion thereof.

3. A sheet holding mechanism according to claim 2, further including a respective wheel having teeth adapted to bite within the undersurface of said paper and fitted between said central portion of the platen and the outer peripheral surfaces thereof, whereby said pressure rollers increase the length of the teeth biting into said paper as they indent the outer peripheral portions of the platen.

4. A sheet holding mechanism according to claim 1, further including a respective wheel having teeth adapted to bite within the undersurface of said paper and fitted between said central portion of the platen and the outer peripheral surfaces thereof, whereby said pressure rollers increase the length of the teeth biting into said paper as they indent the outer peripheral portions of the platen.

* * * * *